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Ohio State Engineer

Title: Engineering Review

Issue Date: Jan-1934

Publisher: Ohio State University, College of Engineering

Citation: Ohio State Engineer, vol. 17, no. 3 (January, 1934), 13-14, 17-19.

URI: http://hdl.handle.net/1811/35102

Appears in Collections: Ohio State Engineer: Volume 17, no. 3 (January, 1934)

Engineering Review

—Courtesy Westinghouse.

Steel Floating on Air

Cobalt steel, an unusual magnetic material developed by P. H. Brace of the Westinghouse Research Laboratories, is so powerful that it floats itself on air by magnetic repulsion. Cobalt steel has from four to five times the magnetic strength of ordinary steel.

To demonstrate its remarkable "floating" ability, Mr. Bruce has arranged two ring-shaped magnets of the material in a framework, one above the other. The lower magnet is enclosed in the base and the upper magnet, free to move up and down on a celluloid guide, "floats" at rest about an inch above the base.

If undisturbed, the upper magnet would float without movement for an indefinite period. If the top ring is given a slight push, it bobs up and down like a light cork on choppy water until it slowly comes to rest in its original position.

The principle of the floating steel magnet is simple. Each cobalt ring is magnetized in such a way that a point on the circumference is the north pole and a point at the opposite end of a diameter is the south pole. The one magnet is placed above the second with the north pole over north pole and south pole above south pole.

Since, like poles repel each other with a force which increases as the distance between the poles becomes less, the free-to-move ring is forced upward. At the same time, gravity is continually exerting a fixed pull downward upon the upper ring. When these two opposing forces balance, the upper ring becomes stationary. Having no visible means of support, it appears to "float" in the air.

Cobalt steel is used by Westinghouse wherever a very strong permanent magnet is required. Its principal uses are in the all-electric speedometer for trains, buses and automobiles and in the portable oscillograph which enables engineers to determine easily the stresses in structural members of buildings, track rails, various parts of machinery and numerous other mechanical structures that are subject to strain.

Experimental Seadrome to be Built

An experimental seadrome, one-fourth of the future intended size, is soon to be built 500 miles off the coast east of Norfolk, Va. This news comes from the U. S. Department of Commerce. The aeronautics division of the Commerce Department has allotted $1,500,000 for the project and if it is successful four other full size seadromes will be placed 500 miles apart connecting the United States and Spain. In years to come they may dot the oceans.

The cost of five full size seadromes would be $30,000,000; a sum less than the cost of a modern liner.

The seadrome will be a floating deck, more than 1200 feet in length and ranging from 150 to 300 feet in width. Towering 150 feet above the water the deck will be safe from the highest wave.

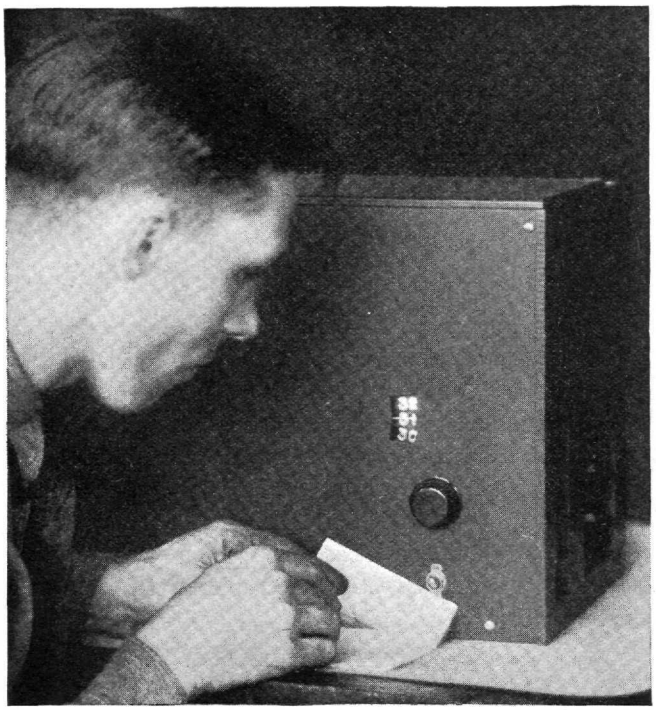
Twenty-eight buoyancy tanks, floating in still water beneath the waves, will support the drome and eliminate the effect of wave motion. These tanks are joined to the deck by streamlined cast iron columns.

A 1000-ft. cable will connect the seadrome to a light buoy which will be connected by an 18,000-ft. steel hawser to a 1500-ton saucer-shaped anchor lying on the ocean floor. Only one end of the drome will be anchored, permitting the other end to trail into the wind. This will allow it to present its full length to landing aviators.

Radio beams and powerful beacon lights will guide the aviator. Each drome will be equipped with a weather station, derricks to lift planes from the water, and seagoing cutters to aid planes in distress.

Edward R. Armstrong is the father of the seadrome idea and has confidence in the project because of numerous experiments with small-scale models.

The obstacle, in the past, to trans-oceanic air services has been that planes must carry so much fuel for the flight that their pay load is reduced. If the seadrome project is successful this stumbling block will be removed and aviation will have completed another progressive step.



—Courtesy Westinghouse.

Cycle Splitter

A high speed timing device recently developed by Westinghouse engineers gives a visual instantaneous indication of minute time intervals by dividing one cycle of a 60 cycle wave into sixty, a hundred or even a thousand parts. Although used in the laboratory to show the fraction of a cycle required for a high speed relay to operate, the method could be used for measuring the time of an operator to apply brakes of an automobile after receiving a signal, the reaction time of an individual during psychological studies, or measurement of elapsed time of almost any brief event.

The timer can take any one of several different forms. One method for dividing one cycle of a 60-cycle wave into 60 parts uses a synchronous-motor-driven disc, rotating behind a shield. Numbers from zero to sixty are cut through the disc at the periphery. As the disc rotates these numbers pass before a viewing slot in the shield. Behind the disc and in line with the slot is placed a mean light which is arranged to flash at the end of the period under observation.

Suppose the time of operation of a relay is to be determined. With the disc being driven at one revolution per second by a 60-cycle synchronous motor, a switch is closed. The circuit is so arranged that the high-speed relay is energized at the exact instant the zero on the disc passes by the viewing slot. When the relay functions, the neon lamp is energized for an extremely short peroid, of the order of a thousandth of a second. The number illuminated by the extremely brief but high intensity flash indicates the time of operation of the relay. Thus, though the number is seen for, say, but a thousandth of a second, the persistence of vision makes the number easily recognizable. The number 17 appearing, for example, indicates that the relay operated in 17/60 of one cycle.

Although not yet commercially available, the device is being used in the Meter and Relay Laboratory of the Westinghouse Electric Company at Newark where it has been found invaluable for use in designing high-speed relay devices. The "cycle splitter," as it is called, is not yet designed for the commercial market.

Measuring Lighting Amperage

Lightning is not the stranger it used to be. It has been photographed, and its finger prints have been taken by means of the cathode-ray oscillograph. Electrical policemen in the form of arresters and cutouts prevent it from doing damage when it goes on a spree around electrical systems. And recently more than 2000 "spies" were sent out to help discover what its amperage might be.

These "spies" are little magnetic links, which can be placed in the legs of transmission towers. When a bolt of lightning passes through the tower, the link is magnetized in proportion to the highest value of the current in the bolt. The link is then placed between the terminals of a crest-surge ammeter, which will show directly the highest current of the bolt. This simple but effective device was developed in the General Engineering Laboratories of the General Electric Company in an endeavor to get information which will enable them to design equipment better to protect electrical service. The little links were scattered over high-voltage transmission lines in Pennsylvania and Virginia, an area which is apparently one of the favorite stamping grounds of lightning. About 100 of the links have reported, and the highest current shown so far has been 60,000 amperes.

Flyers Use Powerful Signalling Lights

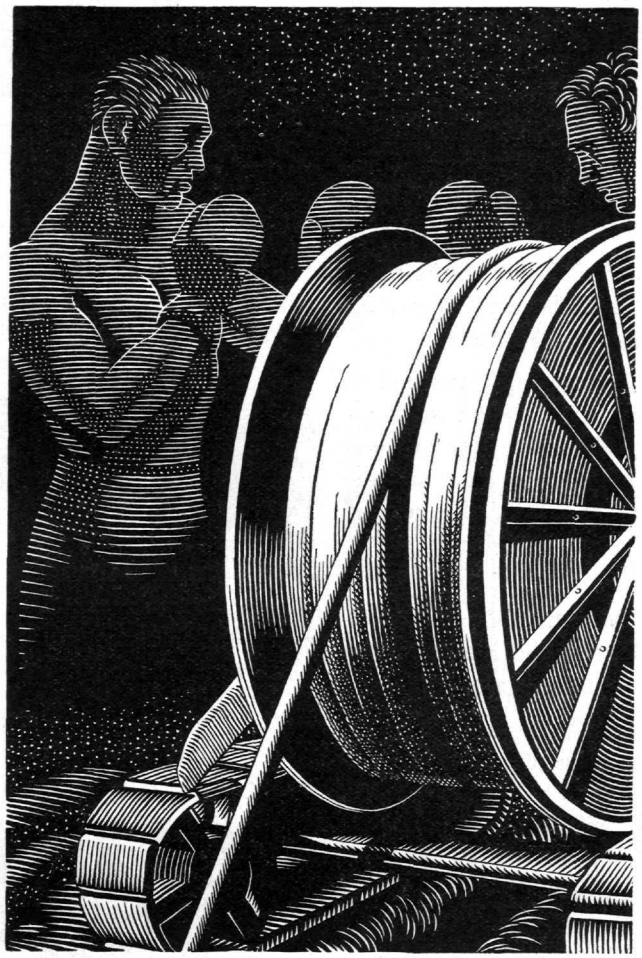
Flyers will soon be aided by a new lightweight "eye" developed in the lighting laboratories of the Westinghouse Electric & Manufacturing Company at Cleveland, Ohio.

These new signalling spotlights, of approximately 150,000 candlepower, are now receiving service tests. These powerful narrow-beam lights rated at 12 volts will be used as dual-purpose units—the lights may be used for signalling purposes with the ground at distances ranging up to five miles and, as a searchlight to pick out buoys and shore lines from two to three hundred yards distant.

Two bases for the light are installed in each seaplane so that the observer may mount the unit on either side of the cockpit. The unit may be kept stored in a compartment except when needed. Kept connected to the current supply, the observer needs only to slip it out of its compartment and place it on its base, to have it ready for service.

The signalling shutter mounts directly on the front of the unit and is operated by a small hand trigger capable of blinking the light at extremely high speed, for code signalling to the ground, where no radio communication is available.

The manly art of self-defense



. . . now applied to telephone cable

Western Electric, manufacturing unit of the Bell System, now makes a tape armored telephone cable ready to meet all comers. When laid directly in the ground, this cable defends itself against moisture, grit, corrosion and other enemies.

Besides the usual lead sheath, the tiny copper wires in the cable are guarded by seven layers of paper, jute and steel tape—all saturated or covered with asphalt compound.

In pioneering and producing improved apparatus, Western Electric contributes to the year 'round reliability of your Bell Telephone.

BELL SYSTEM

WHY NOT TAKE A TRIP HOME BY TELEPHONE?
— TONIGHT AT HALF-PAST EIGHT

Introducing Oxweld Pantosec

As an addition to the Oxweld line of welding and cutting apparatus, The Linde Air Products Company, 30 East 42nd Street, New York, has introduced a new stationary cutting machine of amazing versatility, known as the Pantosec. Being a precision shape-cutting instrument, it is especially suitable for cutting dies, cams, and other parts that must be smoothly and accurately cut. With a cutting range of 44 inches longitudinally and 20 inches laterally, it does straight-line cutting, angle cutting, beveling, circle-cutting and intricate shape-cutting. It requires a floor space of only 72 x 83 inches. Every shop, therefore, that needs a fast, flexible and inexpensive cutting tool will find it in this machine.

The Pantosec can be operated with a minimum of attention from either the templet end or the blowpipe end, as a hand-guided or as a machine-guided instrument. Angles can be cut without templets, since the cutting head can be locked for travel in any direction. Bevel-cutting is simplified; the provisions for adjusting the machine to the work make it possible to line up the blowpipe without shifting the work; and the dividing head enables the operator to set stops on work that is to be cut in several directions.

An extension so mounted as to be always steady and secure, makes it unnecessary for the operator to return to

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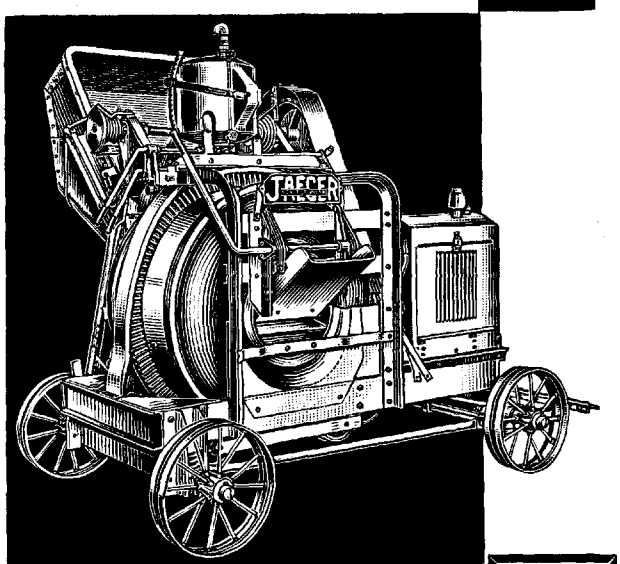

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the back to start the profile cutting after the entry cut has been made.

The machine consists of a carriage mounted on three-point supports. The piping for the gases is all enclosed in the carriage, and all drives are protected by dirt-proof casings. The motor may be specified when ordering to run on either 110 or 220-volt current. All wiring is concealed, and the switches and controls are clearly labeled and easily accessible.

From every standpoint, the Pantosec is a masterpiece among cutting machines, and the shop that wants to do production cutting with a minimum outlay for equipment cannot buy a simpler, stronger, more versatile machine. Though the range of the Pantosec does not include large-scale cutting, it is adequate for all ordinary work. It will be found to be a valuable and time saving addition to any shop, and its ability to do die-cutting quickly and with precision is one of its most attractive features as almost every industry requires dies of one kind or another.

Mercury Lamp

A "Mercury-Rubidium Vapor Lamp" recently developed by Cincinnati scientists has a glow as bright as sunlight. Dr. H. A. Wells, Assistant Professor of Physics, and his colleague, Dr. I. A. Balinkin, instructor, both of the Department of Physics of the University of Cincinnati, have developed the lamp and who have been experimenting with it for two years. They believe that it will be superior to the incandescent lamp and may eventually replace it.

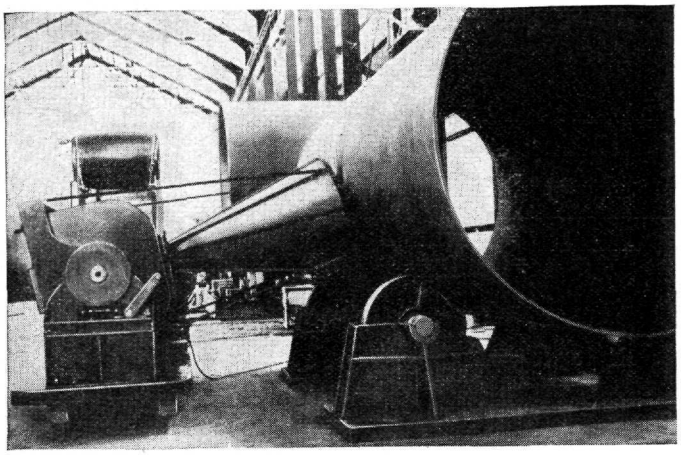
Their experimental model is in the shape of a tube and is filled with Mercury and Rubidium vapors. When connected to a 40-volt power supply, the lamp gives off a non-glaring light which in the intensity of its whiteness closely approaches sunlight.

The lamp has many features which make it worthy of commercial consideration, but if taken up and developed by industry, several difficulties must be overcome. One temperamental tendency which must be corrected is the change in color of the light from white to red-orange. This occurs, Dr. Balinkin explained, when the rubidium atoms temporarily conquer the mercury atoms in their continual struggle in the tube in which each element tries to predominate in giving off the color by which it is known. The lamp must also be developed to eliminate the necessity of tilting the mercury-rubidium vapor tube to start the process of its giving off light when the voltage is applied.

Dr. Balinkin also explained that the industrial scientists may effect the desired changes by experimentation with different ratios of mixtures of the rubidium and the mercury. They, too, must determine the size of a tube light that will be practicable for industrial usage.

Experiments which have been conducted have proven that the lamp gives off three times as much light as an incandescent lamp using the same power.

—*Cincinnati Enquirer.*



—Courtesy General Electric.

X-Ray Weld Inspection

A piece of apparatus that resembles Mr. Edison's old talking machine is now doing the biggest industrial x-ray job yet attempted, the minute inspection of every inch of steel welds in the penstocks for Hoover Dam, for a total distance greater than 75 miles. It is a special shock-proof x-ray machine, rated at 300,000 volts.

When the penstock contract for the dam was awarded to the Babcock and Wilcox Company, it was with the provision that all fusian welds pass x-ray examination. The penstock sections range from 8½ to 30 feet in diameter, and the thickness of the steel is three inches in many places. These giant sections are being welded circumferentially and longitudinally, making it necessary to take 159,000 separate x-ray exposures, involving the use of more than 24,000,000 square inches of x-ray film.

To meet this unusual problem and to keep up with the planned construction schedule, x-ray apparatus of a new type was necessary. It had to have a rating of 300,000 volts in order to produce radiographs through steel plates up to four inches in thickness. Yet, despite the high voltage, it had to be safe in operation. It also had to meet certain space limitations and be easily portable.

This new x-ray equipment, developed by engineers of the General Electric X-Ray Corporation, provides electrical safety through the immersion of the transformer, condensers, Kenotron tubes, and the x-ray tube itself in oil within a sealed and grounded tank. It is impossible for anyone to come into contact with the high tension system while it is in operation. A single cable bringing the low-tension power supply is the only electrical connection.

The apparatus consists of three units—a shock-proof head weighing 5000 pounds, the operator's control unit, and an expansion tank. The head is mounted on a special mechanical carriage, so designed that it can work inside or outside of the penstock, traveling on a narrow-gauge track.

Be not prodigal of your opinions, lest by sharing them with others you be left without.—*Ambrose Bierce.*

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